SEMI-ANNUAL PROGRESS REPORT

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BIOPHYSICAL MODELS AND SATELLITE DATA: CONTINUING ANALYSES OF THE FIFE RESULTS AT THE UNIVERSITY OF MARYLAND

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INTRODUCTION

Efforts continue to focus on using biophysical models driven by remotely-sensed satellite data to describe the energy and mass balance over a vegetated surface. The carbon cycle will also be examined as updated versions of the biophysical models are implemented. Data used in these studies were collected during the FIFE experiments in 1987 and 1989. BOREAS data will be used when it becomes available. The work is supported by NASA grant NAG-5-2117 and direct funding from NASA/GSFC.

RESEARCH ACCOMPLISHMENTS

Activities carried out to date within the FIFE project include the following:

(a) Analysis and Research: Studies into the linear relationship between satellite derived vegetation indices and unstressed canopy conductance during FIFE have been completed. By including SPOT satellite data with LANDSAT satellite data, a larger data set than the one used in Sellers, Heiser et al., [1992] was produced allowing for a more detailed examination of this relationship. Results comparing vegetation indicies derived from these satellite observations with estimates of the unstressed canopy conductance computed from FIFE-87 and FIFE-89 surface flux station data taken on the days of these satellite observations continue to support this linear relationship.

The invariance of this linear relationship at intermediate scales ($30m^2$ to $2x15km^2$) as well as the effects of the spatial variability of topography, soil moisture and vegetation cover on area-averaged surface fluxes have also been studied. Topographical, PBMR soil moisture and SPOT/LANDSAT satellite data collected during FIFE-89 were interpolated onto a 15km x 2.01km grid with a 30m resolution. Site-averaged and 2km x 2km fields were then computed from these 30m fields. By using various combinations of these 30m and site-averaged fields, the effects of their spatial variability was examined. Results from these studies led to the examination of the behavior of soil moisture fields and their effects on area-averaged fluxes as they dry out. Model runs keeping a constant variability in the soil moisture field during a dry-down were compared with real and idealized dry-down runs. The results from these simulations suggest that the non-linearity in soil moisture processes is at least partially cancelled out by the decrease in soil moisture variability as the soil dries out. A scientific paper on this study has been submitted to JGR for acceptance in the second FIFE special issue. In addition to specifying the topography as mentioned above, the calculation

of solar radiation on a sloped surface was included in this study. Results from the 2km x 2km runs were compared with aircraft data.

Preliminary investigations into modelling the carbon cycle have begun using a new version of the Simple Biosphere Model (SiB2) along with data collected during FIFE-89.

(b) Research support for FIS: Sellers and Heiser developed software that eliminates spikes in surface flux station data. This software was given to the FIFE Information System (FIS) in order to create an analyzed supplemental surface flux data set for inclusion on the first volume of the FIFE CD-ROM. This data was then used to create a site-averaged surface flux data set for each intensive field campaign (IFC) in 1987. A scientific paper outlining the procedure used in this analysis and containing the site averaged data has been accepted as a note for the second FIFE special issue in JGR. Similar reports have already been given to FIS for both their on-line and CD-ROM documentation.

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